

5. Services Composition

Jiří Vokřínek

Agent Technology Center

Department of Computer Science

Faculty of Electrical Engineering, Czech Technical University in Prague

jiri.vokrinek@fel.cvut.cz

<http://agents.fel.cvut.cz>

Services Composition

- Service Oriented application is composed by a set of services
- Integration of services provided by different companies/departments/units/etc.
- Value-added integration – aggregation of existing services (re-using, extension, ...)
- Just-in time integration (dynamic composition)

Services Composition Requirements

- Connectivity – connection mechanisms features guaranties
- Correctness – verification of the composition properties (security, deadlock free, etc.)
- Scalability – ability of scale-up with high number of composed services
- Automatic composition
- Non-functional – QoS, security, response time, ...

Services Composition Middleware

- **Abstraction** and **tools** to **define** and **execute** the composite service
- Developer is free to focus on **business logic** instead of implementation/execution details
- Includes:
 - Component model
 - Composition technique and language
 - Development and runtime environment

1970s Composition (UNIX)

- Component Model
 - UNIX commands (filters)
- Composition Technique
 - Pipes (Stdin, Stdout, Stderr)
- Composition Language
 - Shell Scripts
 - Makefiles

```
cat $1 |  
tr -cs A-Za-z '\n' |  
tr A-Z a-z |  
sort |  
uniq -c |  
sort -rn |  
sed 10q
```

2000s Composition (web services)

- Component Model
 - Web services (WSDL interface)
- Composition Technique
 - SOAP/HTTP Messages
- Composition Language
 - BPMN, BPEL, UML, ...
 - JOpera, WebML, XI, ...
 - Java, C#, ...

Services Composition

● We speak about

- Orchestration
- Choreography
- Mashups

Orchestration and Choreography

Orchestration vs. Choreography

- *Orchestration or arrangement is the study and practice of **arranging** music for an orchestra or musical ensemble. In practical terms it consists of **deciding which instruments** should play which notes in a piece of music.*

Orchestration vs. Choreography

- *Orchestration or arrangement is the study and practice of **arranging** music for an orchestra or musical ensemble. In practical terms it consists of **deciding which instruments** should play which notes in a piece of music.*
- *Choreography is the **art of designing sequences** of movements in which motion, form, or both are specified. Choreography may also refer to the **design** itself, which is sometimes expressed by means of dance notation.*

Orchestration vs. Choreography

- *Orchestration or arrangement is the study and practice of **arranging** music for an orchestra or musical ensemble. In a technical terms it consists of **deciding which instruments** should play which notes in a piece of music.*
- *Choreography is the **art of designing sequences** of movements in which motion, form, or both are specified. Choreography may also refer to the **design** itself, which is sometimes expressed by means of dance notation.*

Orchestration vs. Choreography

- *Orchestration or arrangement is the study and practice of **arranging** music for an orchestra or musical ensemble. In a technical terms it consists of **deciding which instruments** should play which notes in a piece of music.*
- *Choreography is the **art of designing sequences** of movements in which motion, form, or both are specified. Choreography may also refer to the design itself, which is sometimes expressed by means of dance notation.*

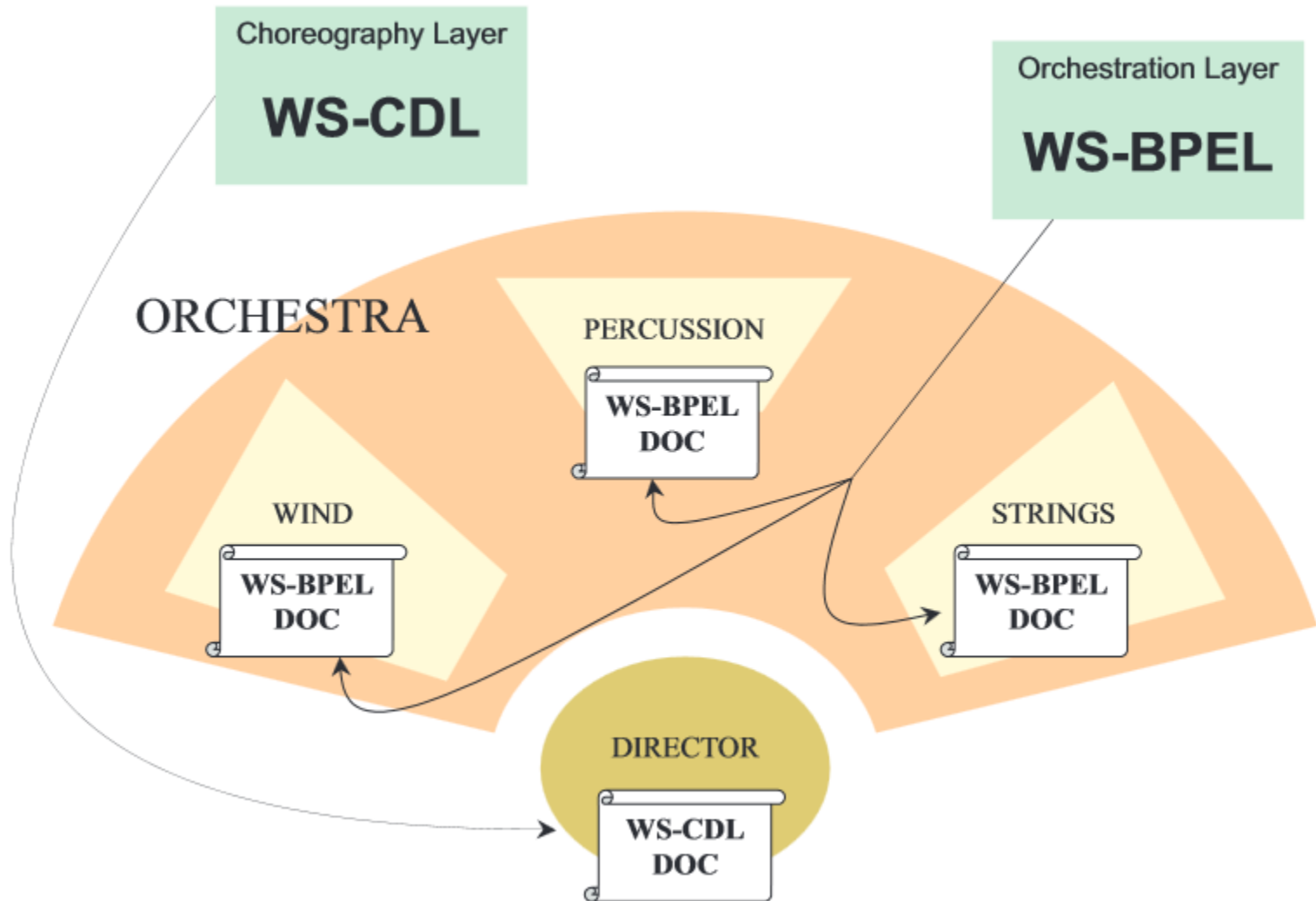
Orchestration vs. Choreography

- *Orchestration or arrangement is the study and practice of **arranging** music for an orchestra or **Business Process Execution Language (WS-BPEL)** deciding which **instruments** should play which notes in a piece of music.*
- *Choreography is the **art of designing sequences** of movements in which motion, form, or both are specified. **Dance** choreography may also refer to the **design** itself, which is sometimes expressed by means of dance notation.*

Orchestration vs. Choreography

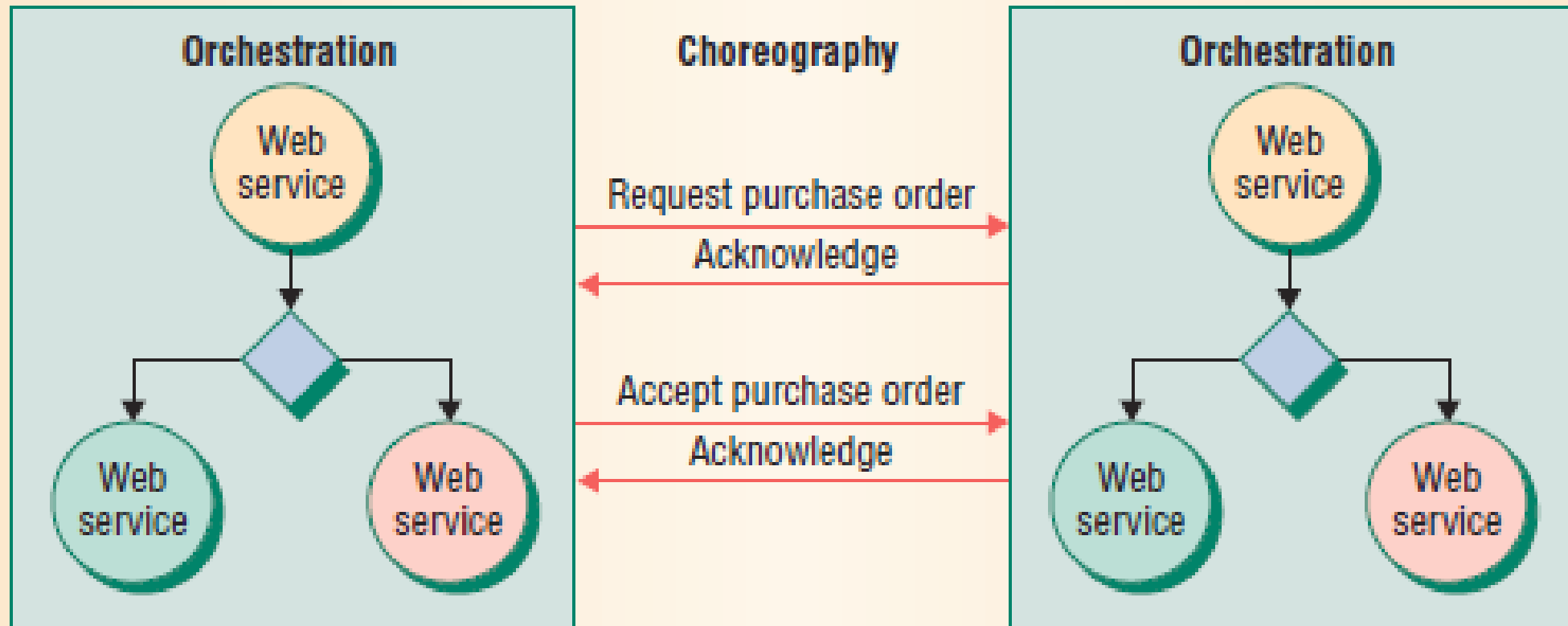
- *Orchestration or arrangement is the study and practice of **arranging** music for an orchestra or **Business Process Execution Language (WS-BPEL)** deciding which **instruments** should play which notes in a piece of music.*
- *Choreography is the **art of designing sequences** of movements in which motion, form, **Web Services Choreography Description Language (WS-CDL)** refer to the **design** itself, which is sometimes expressed by means of dance notation.*

Orchestration vs. Choreography



Orchestration vs. Choreography

- Executable process vs. message sequences

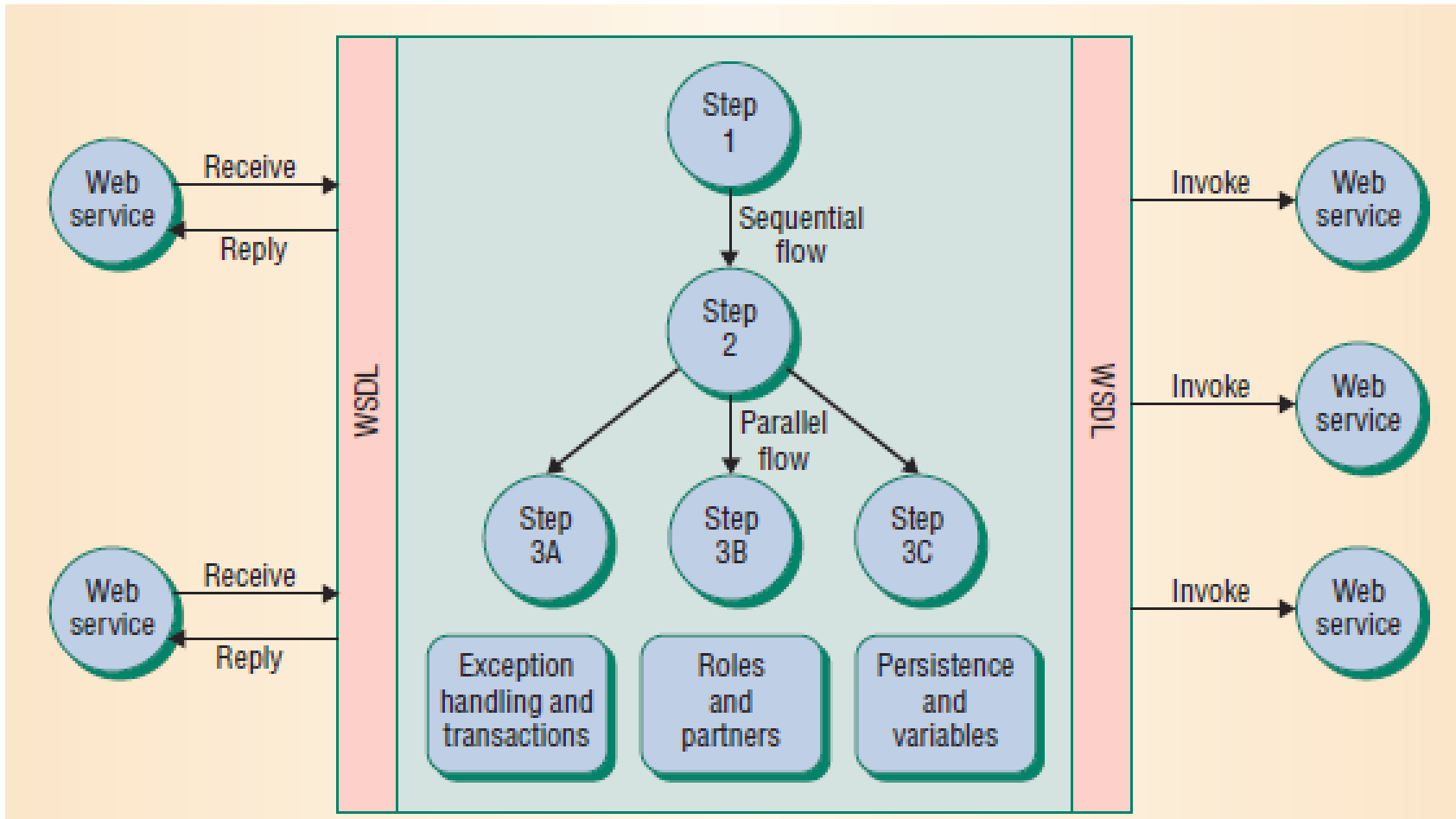


Orchestration

- Describes the automated arrangement, coordination, and management of services
- Represented by BPEL – runtime **executable process**
- Coordination of events in a process
- Directs and manages the on-demand assembly of multiple component services to create a composite application or business process.

Orchestration

● BPEL process example

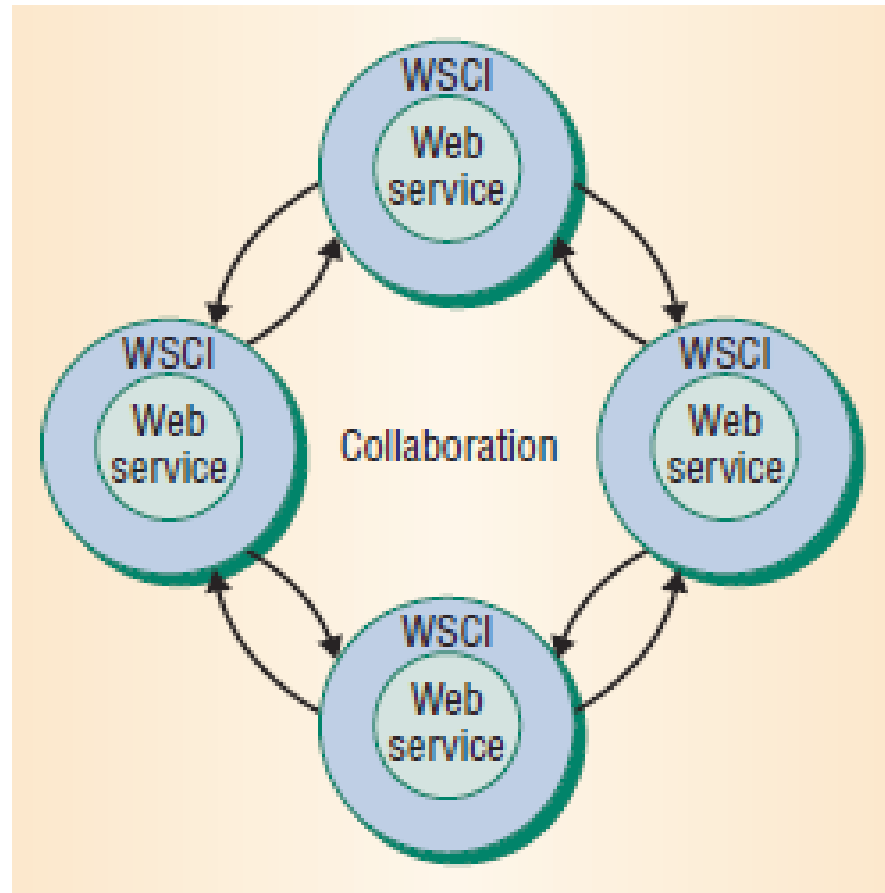


Choreography

- Multi-party Collaboration
- Choreography(Collaboration) Description Language (WS-CDL) – language for describing **multi-party contracts** (extension of WSDL)
- Describes the message exchange patterns
- Applies to shared co-ordination across multiple autonomous systems
- Can be used to monitor message exchanges

Choreography

- Interface address observable behavior between services (not a process)



Mashups

What Is Mashup?

Mashup (music)

From Wikipedia, the free encyclopedia

A **mashup** (also **mesh**, **mash up**, **mash-up**, **blend**, **bootleg**^[1] and **bastard pop/rock**) is a song or composition created by blending two or more pre-recorded songs, usually by overlaying the vocal track of one song seamlessly over the instrumental track of .^[2] To the extent that such works are "transformative" of original content, they may find protection from copyright claims under the "fair use" doctrine of copyright law.^[3]

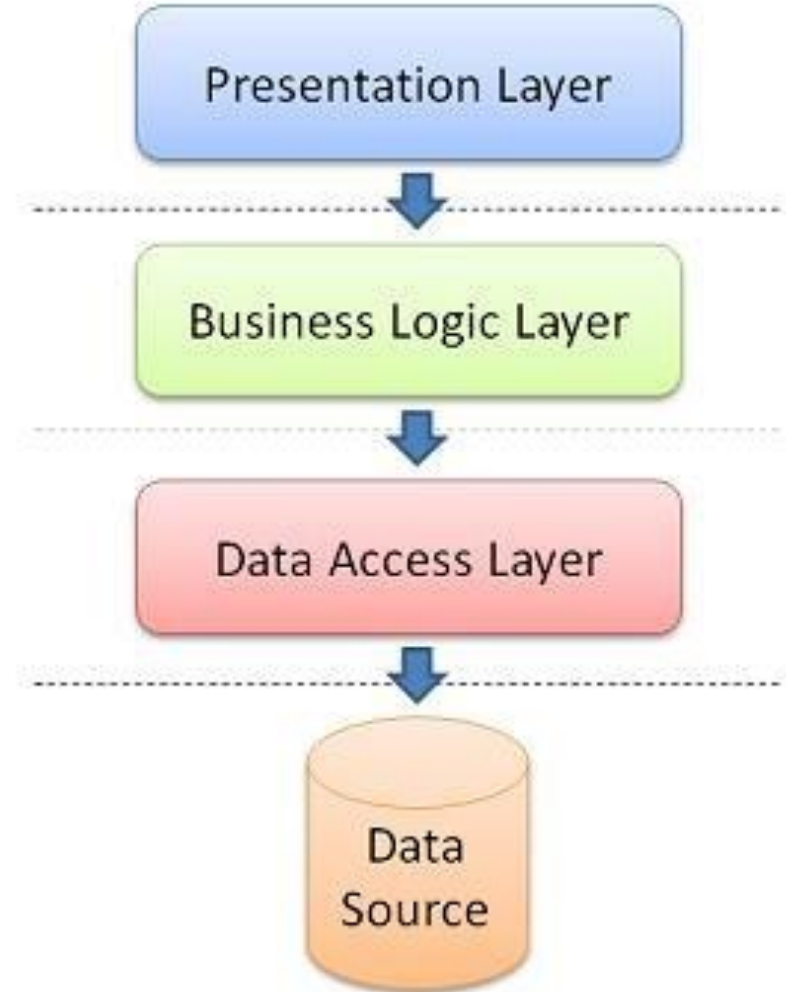


Mashup

- ***Mashup*** is a web page or application that uses and combines data, presentation or functionality from two or more sources to create new services
- Data mashups – composed service from several data sources (uses single representation)
- Consumer mashups – combines different data types (visual elements and data from various sources)
- Business mashups – combined application

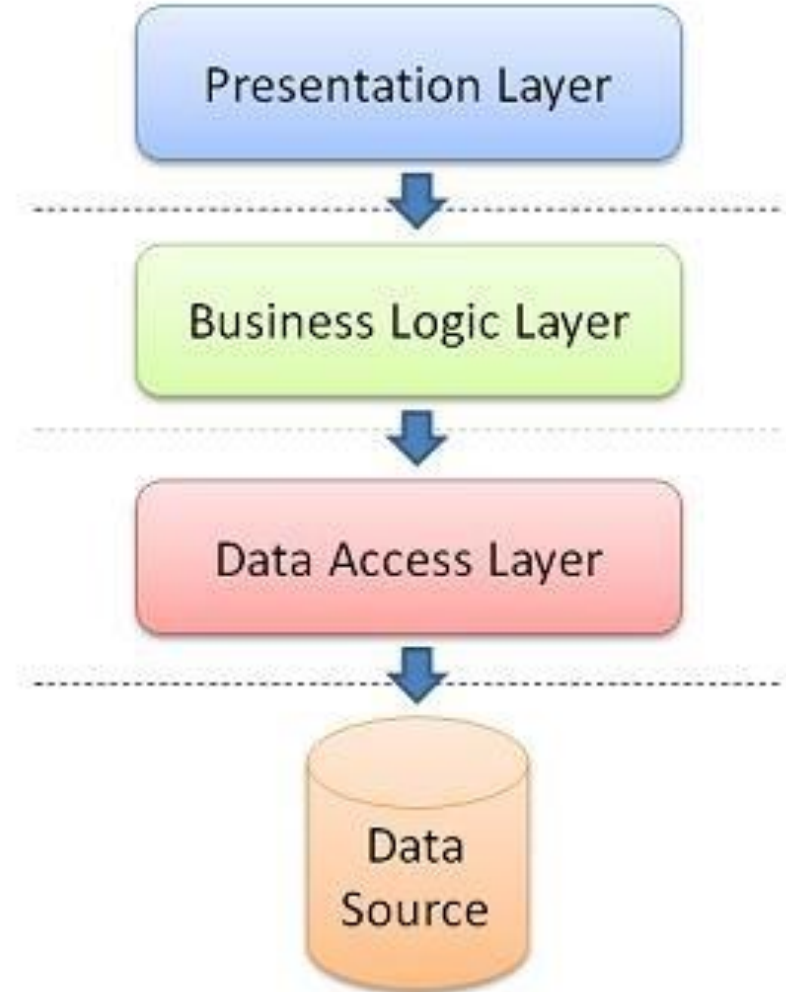
Mashup

- 3-tier architecture
- Presentation – clients and external interfaces
- Business logic on server
- Database management



Mashup

- 3-tier architecture
- Presentation – clients and external interfaces
(1-2 years)
- Business logic on server
(2-5 years)
- Database management
(10 years +)



Mashup

- Software lifetime vs. Moore's law

640 k ought to be enough for anybody. Bill Gates?, 1981

Mashup

- Software lifetime vs. Moore's law

640 k ought to be enough for anybody. Bill Gates?, 1981

Windows 8.1 requirements (32bit): 1GHz, 1GB RAM,
16GB disk, DX9 graphics, res. 1024x768

Mashup

- Software lifetime vs. Moore's law

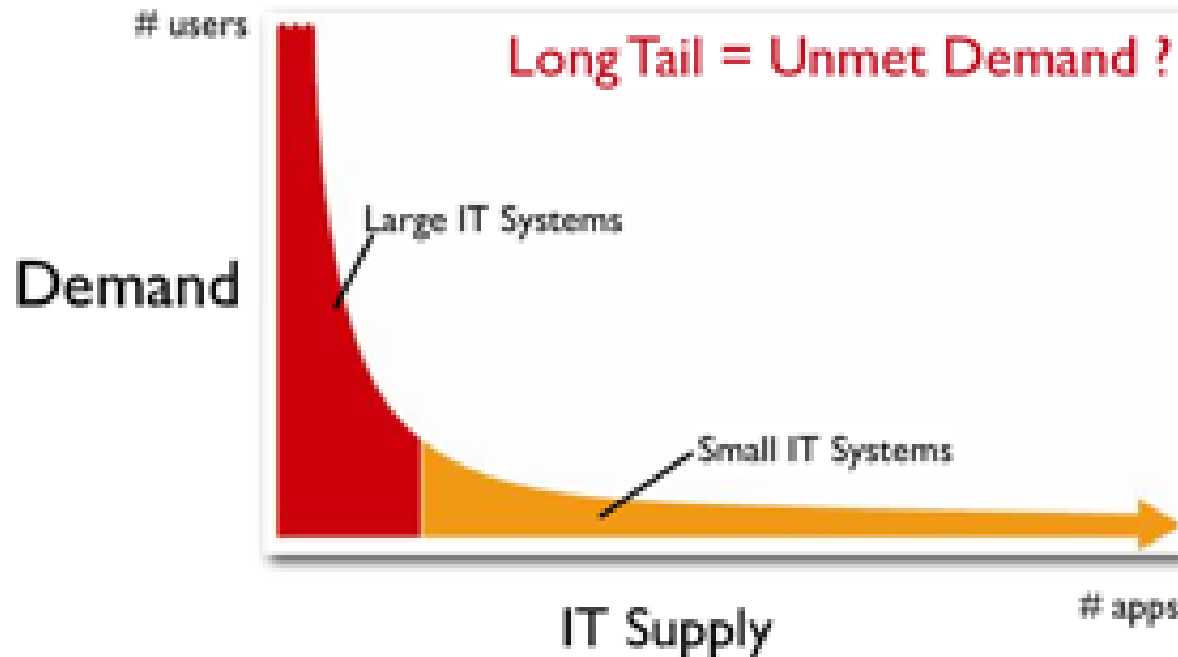
640 k ought to be enough for anybody. Bill Gates?, 1981

Windows 8.1 requirements (32bit): 1GHz, 1GB RAM,
16GB disk, DX9 graphics, res. 1024x768

iPhone 6 specification: dual 1,4GHz, 1GB RAM,
16GB disk, res. 1334x750

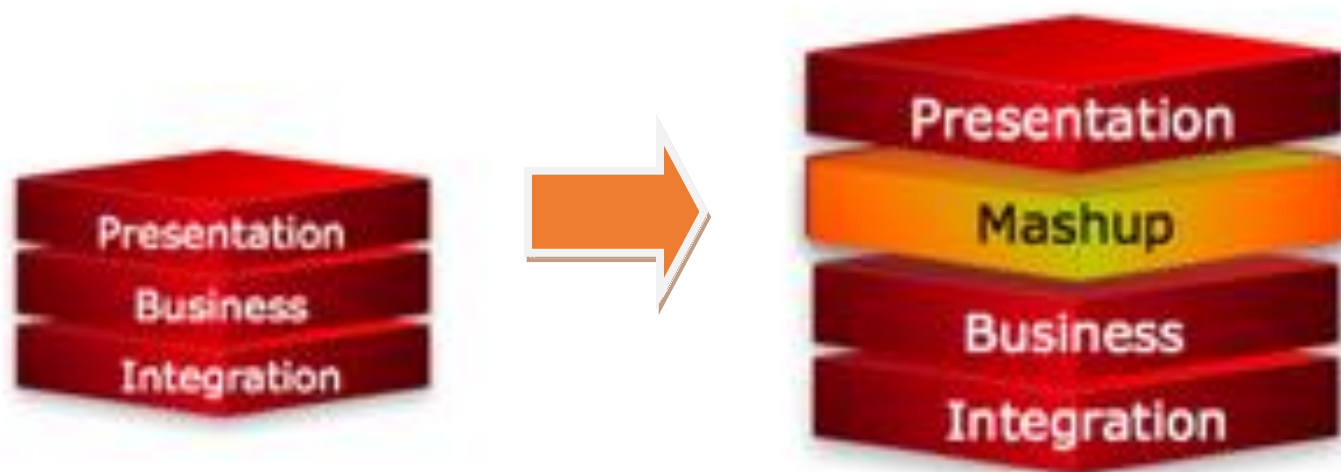
Mashup

- Long Tail of Enterprise Software Demand



Mashup

- Long Tail of Enterprise Software Demand
- Flexible presentation tier -> mashup



What Is Mashup Again?

- Web application composing existing Web services and data sources
- Easy of reuse
- Lightweight programming
- ... anyone can do it!

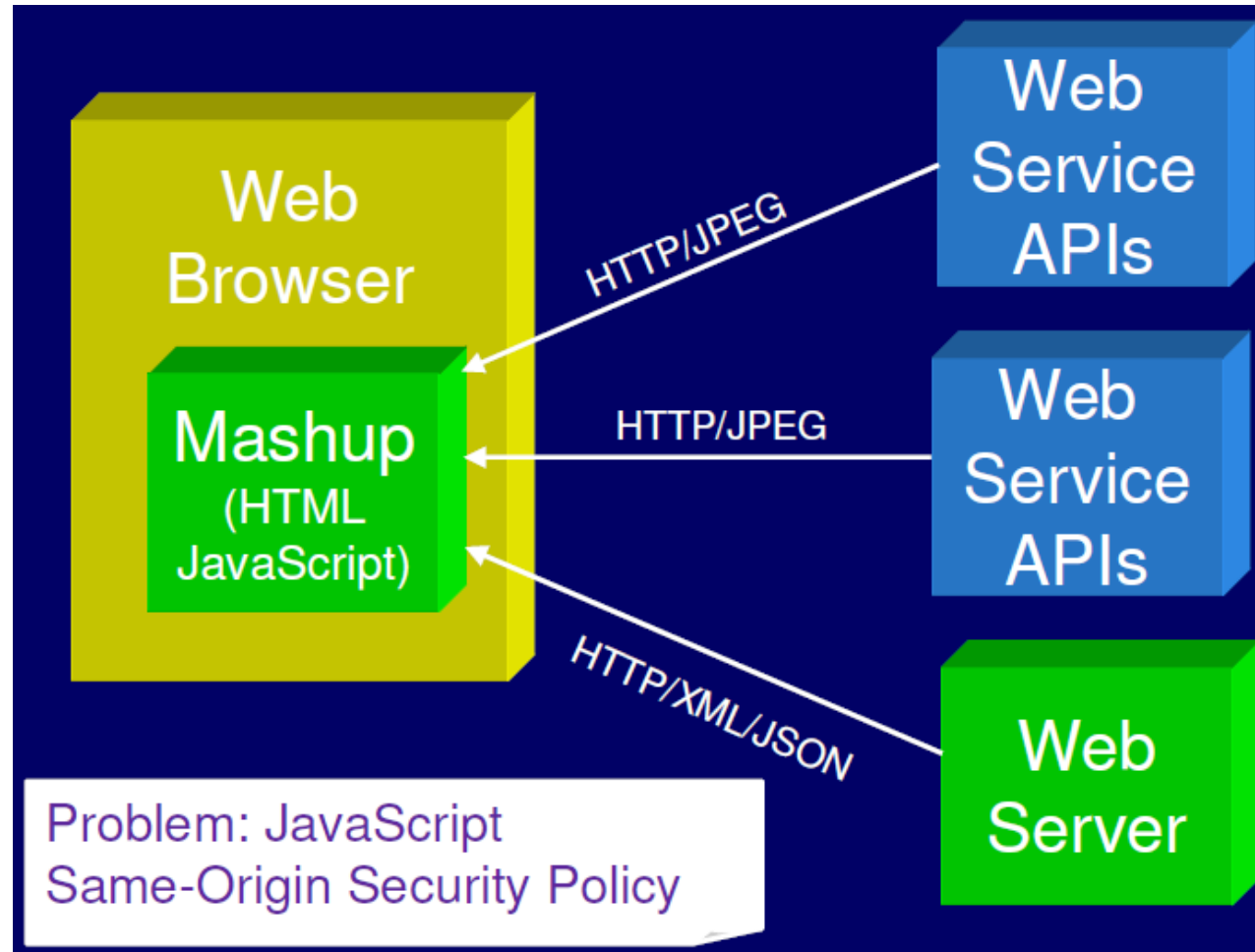


Mashup

- Client based
- Server based

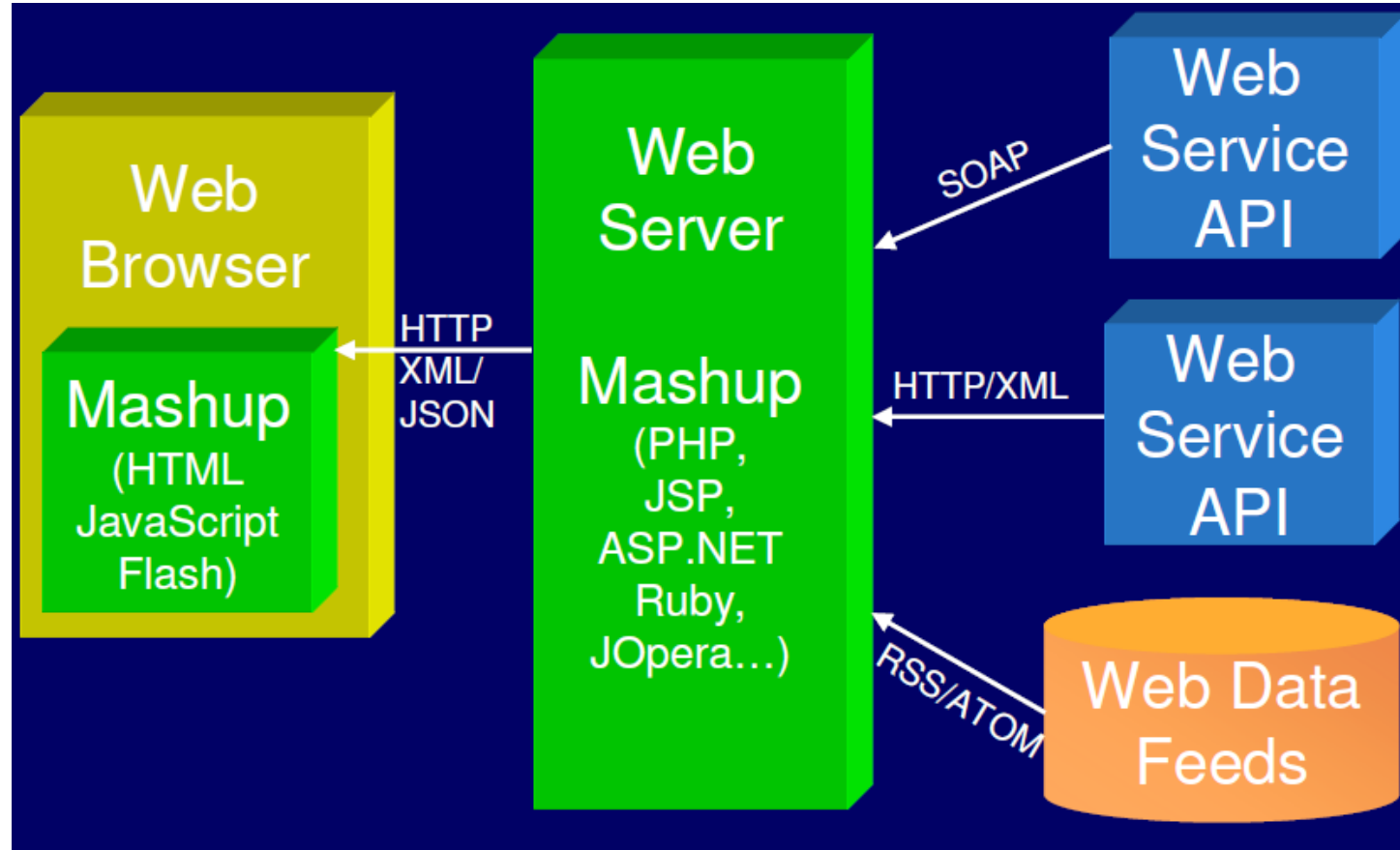
Mashup

- **Client based**
- Server based



Mashup

- Client based
- **Server based**



Build Your Mashup

- Select a mashup metaphor
- Find services and data providers
- Study and test API
- Build the mashup using your favorite technologies or tools

Build Your Mashup

- Metaphors – map, calendar, data stream, wiki, portal, presentation, photo-gallery, ...
- Tools – Yahoo Pipes, Mozilla Webmaker, ...
- Widget libraries – Google/Yahoo maps, Google web toolkit, Dojo, ...

Google map example

- Customizable layers

The screenshot displays the Google Maps interface. At the top left is the Google logo. Below it are buttons for "Vyhledat trasu" (Find route) and "Moje místa" (My places). The main map area shows a street view of Prague, with several layers overlaid: a blue route, a red route, and a green route. A search bar is visible at the top right. The left sidebar contains weather information for Prague, Czech Republic, including a current temperature of 5°C and a 4-day forecast.

Počasí
°C | °F km/h | mil/h | m/s

Počasí pro: Praha, Česká republika

5°C 13°C 7°C	Pá 12°C 2°C	So 12°C 5°C	Ne 17°C 9°C	Po 16°C 6°C
------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Přeháňky
Vlhkost: 100 %
Vítr: JZ rychlostí 9km/h
weather.com

[Každou hodinu | 10 dnů](#)

immo.search.ch example

- Real estate search machine (11 data sources)

Start Phone directory Map Routing Weather Timetable Real estate More services

Apartment/flat rent Price: 0 - 4'750+ .00 Rooms: 1 - 5½+ Area: 0 - 170+ m² Town: To

List with map Property browser Favorites Print file E-mail notification Advertise Help

164 matches ZIP Age Price Rm m² M

Entries prior to 17.10.2013 10:11

	ZIP	Age	Price	Rm	m ²	M
⊕ Attraktive Wohnu..	3007	2 hours	1'100	3	?	▼
⊕ Zentrale Wohnung..	3097	2 hours	1'150	3½	72	▼
⊕ Helle Dachwohnun..	3006	2 hours	1'635	3	?	▼
⊕ Wohnen im Ostri..	3006	2 hours	865	1	30	▼
⊕ Wohnen im Ostri..	3006	2 hours	890	1	30	▼
⊕ Schöne 3-Zimmerw..	3007	2 hours	1'368	3	65	▼
⊕ Hier wohnen Sie ..	3007	1 Day	1'415	3	64	▼
⊕ Inmitten einer g..	3072	1 Day	2'235	5½	115	▼
⊕ Attraktive Lage ..	3012	1 Day	1'240	2	50	▼
⊕ Wohnen an zentra..	3007	2 Days	1'403	3	74	▼
⊕ Schöne 3½-Zimmer..	3072	2 Days	1'120	3	58	▼
⊕ 5 Zimmer Wohnung..	3122	2 Days	1'870	5	100	▼
⊕ Fischermätteliq..	3008	2 Days	910	1½	31	▼
⊕ Helle Wohnung mi..	3097	5 Days	1'080	2	?	▼
⊕ Länggasse, Muesm..	3012	5 Days	1'880	4	96	▼

Map Aerial

Länggasse Bern Kirchen Mattenhof Weissenbühl Wabern Spiegel bei Bern

mobile.de example

● Online vehicle marketplace

SEARCH OFFER

Make
Any

Model
Any

Price until
Any

First Registration starting from
Any

Kilometer up to
Any

Fuel Type
Any

Country
Any

Zip
None




Radius
None

[Detailed Search](#)

Show results

Počet výsledků: 10 242 1 € = 25.68 Kč

Zúžit hledání Cena: od nejnižší

	Ford Mondeo 11/1993 279 000 km Manuální 66 kW (90 PS)	100 € (brutto) 2 568 Kč
06193 Wettin-Löbejün (Soukromý prodejce)		Vzdálenost: 243 km
	Ford Mondeo 04/1997 196 000 km Manuální 85 kW (116 PS)	150 € (brutto) 3 852 Kč
83043 Bad aibling (Soukromý prodejce)		Vzdálenost: 302 km
	Ford Mondeo Turnier CLX 04/1993 250 000 km Manuální 85 kW (116 PS)	150 € (brutto) 3 852 Kč
01723 Kesselsdorf (Soukromý prodejce)		Vzdálenost: 123 km

woozor.co example

Weather in Prague, Czech Republic (Europe)



Thursday, October 17 2013

Day



Rain.

Night



Rain.

High : 14°C

Low : 8°C

Wind : WSW at 19 km/h

[More information](#)

● °C ○ °F

● km/h ○ m/h

Evolutions

